Docket No.: 2328-023RI **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	
DUANE C. GATES	:	Confirmation No. 9066
U.S. Patent Application No. 09/534,814	:	Group Art Unit: 3742
Filed: March 22, 2000	:	Examiner: Mark H. Paschall

For: SEGMENTED COIL FOR GENERATING PLASMA IN PLASMA PROCESSING EQUIPMENT

REPLY BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Appellant responds as follows to the Examiner's Answer mailed March 24, 2009.

I. The Sloppiness of the Examiner's Answer

The Examiner's Answer is sloppy, inter alia, because it refers to (1) nonexistent portions of appellant's claims, (2) nonexistent limitations of appellant's claims, (3) allowed claim 30 when it apparently meant to discuss rejected claim 39, and (4) refers to "Appellant's remarks on pages 1 -- 11 in the instant arguments." Appellants will, in this reply brief, correct the foregoing instances of sloppiness in the hope that such action will avoid a remand. A casual reading of the entire examiner's answer reveals additional sloppiness which need not be discussed.

A remand is to be avoided because of the dilatory manner in which the examiner has handled the prosecution of this application which was filed March 22, 2000. Appellant submitted an April 17, 2006 amendment in response to a January 19, 2006 non-final rejection. The next action by the examiner was a December 31, 2007 final rejection. Appellants second appeal brief was filed May 28, 2008 in response to the

December 31, 2007 final rejection. The examiner's answer was not mailed until March 24, 2009, despite considerable prodding of the examiner and his supervisor by the office of attorney for appellant. The first appeal brief, filed December 1, 2004, was followed by the January 19, 2006 non-final rejection.

Appellant is concerned that a remand will result in continued dilatory action by the examiner. If the Board does remand, the Board should impose a short time period for the examiner to respond (for example, one month) and the Board should impose sanctions on the examiner if he fails to timely respond (for example, by instructing the examiner to allow all claims).

The Examiner's Answer is sloppy because the first and third sentences of the paragraph beginning approximately in the middle of page 3 refer to lines 7-13 of claim 39, lines 10-16 of claim 45, lines 10-17 of claim 51 and lines 8-15 of claim 54, while the sixth sentence of this paragraph refers to lines 15 and 16 of claim 51 and lines 14 and 15 of claim 56. Similar allegations concerning claim 39, lines 7-13, claim 45, lines 10-16, claim 51, lines 10-17, claim 54, lines 8-15, claim 51, lines 15 and 16, and claim 56, lines 14 and 15 appear in the first, third and sixth sentences in the paragraph bridging pages 6 and 7 of the Examiner's Answer. The Claims Appendix filed with the original brief is such that claims 39, 45, 51 and 54 respectively include 10, 11, 12 and 11 lines. Hence, the allegations in the Examiner's Answer that claims 39, 45, 51 and 54 respectively include lines 7-13, lines 10-16, lines 10-17 and lines 8-15, and that claim 51 includes lines 15 and 16 are patently incorrect. In the Claims Appendix, claim 56 includes two lines, so that the allegation in the Examiner's Answer that claim 56 includes lines 14 and 15 is wrong. Similar deficiencies with regard to the claims as submitted prior to the final rejection are set forth in the first paragraph of the Argument section VII (A) , page 9 of the original brief, which the examiner has obviously ignored.

It is apparent from the paragraph bridging pages 6 and 7 of the Examiner's Answer that the references to appellant's claims should have been to claim 39, lines 6-

10, claim 45, lines 7-11, claim 51, lines 7 and 12, claim 54, lines 5, 6, 10 and 11.

The allegations concerning claim 56 in the sixth sentence of the last paragraph on page 3 and in the first full sentence on page 7 of the Examiner's Answer are completely unfounded as they refer to "the lead having at least a portion that is straight." Claim 56 includes no such limitation, but indicates the exterior coil portion includes plural radially and circumferentially extending terms.

The Examiner's Answer is also sloppy because it refers to nonexistent limitations of appellant's claims. The first three sentences of the paragraph beginning approximately in the middle of page 3 of the Examiner's Answer indicate claims 51 and 54 describe different magnetic fluxes for different coil portions. In fact, there is no mention in either claim 51 or claim 54 of magnetic fluxes. Instead, these claims only define the geometry of the interior, intermediate and peripheral portions of the coil, as pointed out on page 9, in section VII (A), second paragraph of the original brief, which the examiner has obviously ignored.

The Examiner's Answer is sloppy because the first line of the first full paragraph on page 8 refers to allowed claim 30 when it apparently means to discuss rejected claim 39.

The Examiner's Answer is also sloppy because the first line of the paragraph beginning at the bottom of page 5 states "Appellant's remarks on pages 1-11 in the instant arguments advance that ,". Appellants Argument section VII of its original brief begins on page 9, and continues to page 18.

II. Claims 39-58 comply with 35 USC 251 and 35 USC 112, first paragraph

The Examiner's Answer includes evidence that claims 39-58 comply with 35 USC 251 and 35 USC 112, first paragraph, by stating on page 2: "The summary of claimed

subject matter contained in the brief is correct." The Summary of Claimed Subject Matter, section V, of the original brief, refers to independent claim 39 as including: "Coil 50 (Figure 4 or 5) includes interior portion 52, peripheral portion 54 and an immediate portion, in the form of a straight lead that is between and connects the interior and peripheral portions to each other (page 4, line 59-page 5, lines 2). The interior, intermediate and peripheral portions have turns (Figure 4 or 5) connected to each other and arranged so the magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate coil portion (inherent, as indicated by paragraph 3 of Patrick Declaration, Exhibit 2)." The Summary of Claimed Subject Matter, section V, of the original brief refers to independent claim 45 as including: "Coil 50 (Figure 4 or 5) comprises an interior portion 52, peripheral portion 54 and an immediate portion, in the form of a straight lead that is between and connects the interior and peripheral portions to each other (page 4, line 59-page 5, lines 2). The interior, intermediate and peripheral portions have turns (Figure 4 or 5) connected to each other and arranged so the magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate coil portion (inherent, as indicated by paragraph 3 of Patrick Declaration, Exhibit 2)." The Summary of Claimed Subject Matter, section V, of the original brief refers to independent claim 51 as including: "The coil 50 has an interior portion 52, and a peripheral portion 54 (page 4, line 59 and-page 5, line 2. As illustrated in Figures 3-5, interior portion 52 has plural radially and circumferentially extending turns and exterior portion 54 has at least one circumferentially extending turn. As illustrated in Figures 3-5, the intermediate portion is configured so it (a) does not include a complete turn, (b) is substantially less than a complete turn, and (c) includes a lead connected to ends of the terms of the interior and exterior portions. Figures 4 and 5 indicate the lead has at least a portion that is straight." The Summary of Claimed Subject Matter, section V, of the original brief refers to independent claim 54 as including: "Coil 50 includes an interior portion 52, and a peripheral portion 54. As illustrated in Figures 3-5, the interior portion 52 has plural radially and circumferentially extending turns and the exterior segment 54

has at least one circumferentially extending turn. As illustrated in Figures 3-5, the intermediate portion is configured so it (a) does not include a complete turn, (b) is substantially less than a complete turn, and (c) includes a lead connected to ends of the terms of the interior and exterior portions. The lead has at least a portion that is straight."

Based on the foregoing, the claimed subject matter of independent claims 39, 45, 51 and 54 is found in appellant's disclosure as filed, and applicant has pointed out specifically where the original disclosure provides information to one of ordinary skill in the art as to the foregoing subject matter of independent claims 39, 45, 51 and 54. Because the summary of claimed subject matter contained in the brief uses the language employed in the independent claims and has been admitted by the examiner as being correct, it follows that the examiner has also conceded that independent claims 39, 41, 51 and 54 comply with 35 USC 251 and 35 USC 112, first paragraph. Thus, the summary of claimed subject matter clearly indicates what is meant in the claims by interior, intermediate and peripheral portions. It also clearly indicates that the intermediate portion connecting interior portion 52 and exterior or peripheral portion 54 is a straight lead connecting the interior and peripheral portions of the coil to each other. It is apparent that this straight lead between portions 52 and 54 meets the requirements of claims 40, 46, 51 and 54 which require the intermediate portion to be configured so it (a) does not include a complete turn, (b) is substantially less than a complete turn, and (c) includes a lead connected to ends of the turns of the interior and exterior portions as Dr. Patrick has testified.

The sentence bridging pages 7 and 8 of the Examiner's Answer attempts to respond to the appellant's position that it is inherent for the magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions to exceed the magnetic flux density coupled to the plasma by the intermediate coil portion by stating that magnetic flux density is dependent on multiple parameters, such as current variation and spacing of the coil turns relative to one another; a similar position is set

forth in the second full paragraph on page 8 of the Examiner's Answer. In response, neither the current variations nor the spacing of the coil turns is a factor in appellant's coils of Figures 4 and/or 5.

When switch S1, Figure 4, is open, substantially the same current flows in the interior portion 52, exterior portion 54 and the intermediate portion of coil 50 between portions 52 and 54 because the current which flows from a terminal at the interior of the coil to a terminal at the exterior of the coil has only one path, as indicated by item (4) of paragraph 3 of the Patrick Declaration. Similarly, when switch S2, Figure 5, is closed substantially the same current flows in the interior portion 52, exterior portion 54 and the intermediate portion of coil 50 between portions 52 and 54 because the current which flows from a terminal at the interior of the coil to a terminal at the exterior of the coil has only one path, as indicated by item (4) of paragraph 3 of the Patrick Declaration. While there might be transmission line effects to cause the current in different parts of the coil to be slightly different from each other, the transmission line effect on the current is not sufficiently great to cause the magnetic flux density in the intermediate portion of coil 50 to exceed the magnetic flux density in the interior and exterior coil portions 52 and 54, as indicated by items (6) and (7) of paragraph 3 of the Patrick Declaration. Hence, the current variations alluded to in the Examiner's Answer are not a factor, vis-à-vis claims 39 and 45, in affecting the magnetic flux produced by the different portions of the coils of appellant's Figures 4 and 5. This position is supported by the statement in the last sentence in the second full paragraph on page 8 of the Examiner's Answer which states that the described and series connected coil segments have a common current.

While it is true that the spacing of coil turns relative to one another can be a factor in determining the magnetic flux density obtained from a coil, the intermediate coil portion, between interior coil portion 52 and exterior coil portion 54 (as described above), is a straight lead. As such, the intermediate coil portion does not have anything resembling a complete turn. Consequently, the magnetic coupling effect obtained from the intermediate coil portion is obviously less than that of the interior coil portion 52,

which is illustrated as having two complete turns, and is also obviously less than that of the exterior coil portion 54, which is illustrated as having approximately 2 1/2 complete turns. Because approximately the same current flows through each of the interior, intermediate and exterior coil portions of coil 50 in the embodiments of Figures 4 and 5 when switches S1 and S2 are respectively open and closed and the magnetic coupling effect of the intermediate coil portion is less than those of the interior and exterior portion of the coil the magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate coil portion, as set forth in item (1) of paragraph 3 of the Patrick Declaration.

The paragraph bridging pages 5 and 6 of the Examiner's Answer alleges "Full faith and credit is given to the Examiner in the designated application, but the duty of the present Examiner lies with the present application and this duty is directed to the presence of new matter entered within a reissue application , and these instant claims are treated accordingly (sic)." In fact, the examiner in the present case has not given full faith and credit to the examiner who determined that all of the disputed limitations of claims 39 and 45 were inherently disclosed by the present application. The disclosure of the present application is identical to the disclosure in the patent relied on by the examiner who handled the prior application. The examiner in the present case has given no adequate basis for stating that the rejection set forth by the examiner in the other case is incorrect.

The first sentence on page 9 of the Examiner's Answer states the Patrick Declaration has been addressed in the final rejection on pages 4-5. The sentence bridging pages 4 and 5 of the final rejection merely states the Patrick Declaration has been reviewed and noted in the file and proper weight has been given to the declaration. Page 5 of the final rejection then states the Patrick Declaration argues that the claimed features are inherent features. However, neither the final rejection nor the Examiner's Answer indicates why the statements in the Patrick Declaration, which

support the inherency argument set forth by the examiner in the other case, are not valid.

The arguments set forth in the paragraph bridging pages 6 and 7, the first full paragraph on page 7 and on page 8 of the Examiner's Answer are based on the proposition that the words of the claims must be found in the words of the specification. There has been no reply to the argument set forth on pages 16 and 17 of the original brief that the description need not be in *ipsis verbis*. The examiner has not adequately stated why the rationale advanced by appellant is wrong

The third sentence on page 9 of the Examiner's Answer states: "However no mention is made in the claimed subject mater of the spacings of the coils, the current through the coils, the diameter of the coils and the variation of magnetic flux through the coil portions. All of the above parameters are critical to the variation of magnetic flux from one portion to another coil portion. The variation of magnetic flux is not inherent, minus discussion of these parameters (sic)." There is no reason why the claims should include reference to the current flowing through the coils or the diameter of the coils. The claims do, in fact, refer to the spacing of the coil portions by indicating there are interior, intermediate and peripheral coil portions. In addition, claims 39 and 45 indicate the magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate coil portion. This position in the final rejection appears to be inconsistent with the basic rejections stating there is an inadequate basis in the specification for the claimed terminology.

While the diameter of the coils might be critical to the variation of the magnetic flux from one coil portion to another coil portion, the diameter of the intermediate coil portion, that is, the straight lead between interior coil portion 52 and exterior coil portion 54, is merely the diameter of the straight lead. As such, the magnetic flux produced by the straight lead is considerably less than the magnetic fluxes produced by the larger

diameter interior coil portion 52 and exterior coil portion 54. Hence, the diameters of the various coil portions support the inherency argument that the magnetic flux density coupled to the plasma by each of the interior and peripheral coil portions exceeds the magnetic flux density coupled to the plasma by the intermediate coil portion.

The last three sentences of the paragraph beginning at the top of page 9 of the Examiner's Answer state: "The board of Appeals should note that the variation of magnetic flux is critical to the instant claimed subject matter and has no basis in the original patent filed. To just state that this feature is "inherent" carries no persuasive weight in the instant appeal. This feature is the crux of the present invention (sic)." Because there is no mention of magnetic flux in independent claims 51 or 54, or any of the claims dependent thereon, the foregoing statements are not applicable to claims 51-58. Appellant agrees magnetic flux density is the crux of the subject matter of claims 39 and 45. However, there is no reason why the inherent feature should not be given persuasive weight.

III. The rejection of claims 39 and 45 based on Bignell is wrong

.

The paragraph on page 5 of the Examiner's Answer dealing with the rejection of claims 39 and 45 based on Bignell admits Bignell fails to disclose a work holder but alleges that is routine and obvious to use a work support, depending on the nature of the work processes. The paragraph bridging pages 9 and 10 of the examiner's answer alleges a "work gas" is held within "work holder 12" that the examiner also admits is a tube. The rejection of claims 39 and 45 fails to consider the requirements of these claims for (1) a "workpiece holder" that is in a low-pressure chamber and (2) a coil positioned to couple an RF field to the gas for exciting the gas to the plasma state, wherein the workpiece is adapted to be affected by the thus excited plasma.

Bignell et al. is directed to a plasma arc heating apparatus having an open end, illustrated in Figure 1 at the bottom of slab wall 14, for exit of heated gases without

appreciable ionization (i.e., not a plasma), wherein the gas is preferably heated to a temperature in the range from about 2000-6000°F, as indicated by column 2, line 69-column 3, line 4, claim 1 and column 8, lines 17-20. To this end, gas under pressure is injected into the interior of tubular member 26 via auxiliary inlet connection 36. The gas flowing through inlet connection 36 is ionized, that is, formed into plasma (indicated by reference numeral 49), by a high pulsating DC voltage between anode 38 and cathode 40. The plasma arc, Figure 2b, is concentrated (as indicated by reference numeral 55) at the center of helical coil 11, that is wrapped around the exterior of refractory dielectric core guide or tube 12. Because the helical turns of coil 11 are more closely spaced at the opposite ends of the coil than at the center of the coil, when the coil is energized with electrical current from high frequency oscillator 61, the magnetic field intensity or flux density in the core of the coil is greater at the coil ends than at the center of the coil to provide a magnetic bottle effect to concentrate the plasma arc at the center of the coil; column 4, lines 41-50. The plasma arc (indicated by reference numeral 55) at the center of coil 11 and core guide or tube 12 heats unionized gas injected under pressure to gas heater unit 10 by inlet 31, whence the gas flowing through inlet 31 is sprayed into the interior of tubular member 26 by spray nozzles 32, 33; column 3, lines 72-75 and column 8, lines 17-20.

Because pressurized gas is injected via inlets 31 and 36 into a volume surrounded by radiator member 13 having an open end remote from inlets 31 and 36, the volume surrounded by radiator member 13 cannot be considered a low-pressure chamber. The pressure within radiator member 13 is obviously higher than atmospheric. Otherwise, the gas which is injected under pressure via inlet 31, and flows from the bottom of radiator member 13 (presumably to the atmosphere), could not exit to the atmosphere from one end of the radiator member, as required by claim 1 of the Bignell patent. In contrast, claims 39 and 45 are directed to low-pressure plasma processors for treating workpieces with plasma. Such low-pressure plasma processors operate at pressures considerably lower than atmospheric, such as less than 100 millitorr (page 3, lines 3-5 of the application as filed).

One of ordinary skill in the art would not have modified the Bignell plasma arc heating apparatus to include a workpiece holder for carrying a workpiece that is adapted to be affected by plasma. The Bignell plasma arc heating apparatus is designed to supply substantially unionized gas at temperatures ranging from about 2000-6000°F to a structure outside of the plasma arc heating apparatus. While no temperature range is given for the plasma arc 55, it is apparent that the plasma arc temperature must considerably exceed 2000°F to achieve a temperature of 2000°F for the unionized gas that flows from the plasma arc heating apparatus Bignell discloses. The type of workpieces employed in low-pressure plasma processors, such as semiconductor wafers (page 1, line 50 and page 2, line 64-page 3, line 5 of the application as filed), would have a difficult time sustaining temperatures considerably in excess of 2000°F. As a result, one of ordinary skill in the art of plasma workpiece processors would not have considered the magnetic bottle coil 11 of Bignell for the plasma excitation coil of a low pressure plasma processor having a low pressure chamber for treating a workpiece on a workpiece holder, as claims 39 and 45 require.

As discussed above, the gas flowing through inlet 36 is converted into plasma by the high pulsating DC voltage applied between anode 38 and cathode 40. Column 7, lines 51-60 indicates that if the arc is maintained solely by high frequency energization of coil 11 the arc (1) has a tendency to be unstable, (2) has relatively little ability to heat the gas flowing through inlet 31 and through the coil core and (3) is relatively inefficient in transforming electrical power applied to the coil into heat. Because the high frequency electrical energization of coil 11 is supplemented by the ion flow from the ion gun formed between anode 38 and cathode 40, the plasma arc 55 is greatly enlarged in volume, increased in temperature and the efficiency of electrical and thermal power conversion is greatly increased. In other words, the Bignell structure does not rely on the excitation by high frequency oscillator 61 of coil 11 to couple an RF field to the gas within tube 12 so that gas is excited to the plasma state, wherein the thus produced plasma is adapted to affect a workpiece. Instead, the excitation by high frequency

oscillator 61 provides a magnetic bottle effect to concentrate, at the center of coil 11, the plasma that was created by the DC pulses between anode 38 and cathode 40 ionizing the gas flowing through inlet 36.

Thus, Bignell actually teaches away from the structures defined by claims 39 and 45 so one of ordinary skill in the art would not have modified Bignell to include the requirements of claims 39 and 45 for (1) a "workpiece holder" that is in a low-pressure chamber and (2) a coil positioned to couple an RF field to the gas for exciting the gas to the plasma state, wherein the workpiece is adapted to be affected by the thus excited plasma.

Reversal of the rejection is in order.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

LOWE HAUPTMAN HAM & BERNER, LLP

/Allan M. Lowe/

Allan M. Lowe
Registration No. 19,641

1700 Diagonal Road, Suite 300
Alexandria, Virginia 22314
(703) 684-1111
(703) 518-5499 Facsimile
Date: May 26, 2009
AML/cjf